Claims

[c1] 1.A precursor composition for CVD formation of low k dielectric films, said composition comprising a gaseous mixture of (i) at least one aromatic compound, (ii) an inert carrier medium and (iii) optionally at least one unsaturated constituent that is ethylenically and/or acetylenically unsaturated.

[c2] 2.The composition of claim 1, comprising said at least one unsaturated constituent that is ethylenically and/or acetylenically unsaturated.

[c3] 3.The composition of claim 2, wherein said at least one unsaturated constituent that is ethylenically and/or acetylenically unsaturated, comprises at least one compound that is separate and distinct from said at least one aromatic compound.

[c4] 4.The composition of claim 2, wherein said at least one unsaturated constituent that is ethylenically and/or acetylenically unsaturated, comprises a moiety of said at least one aromatic compound.

[c5] 5.The composition of claim 1, comprising an aromatic compound containing at least one ethylenically unsaturated functional group (>C=C<) in its molecular structure.

[c6] 6.The composition of claim 1, comprising an aromatic compound containing at least one acetylenically unsaturated functional group (C ≡ C–) in its molecular structure.

[c7] 7.The composition of claim 1, comprising an aromatic compound containing at least one ethylenically unsaturated functional group (>C=C<) and at least one acetylenically unsaturated functional group (C ≡ C) in its molecular structure.

[c8] 8.The composition of claim 1, comprising an aromatic compound and a separate and distinct ethylenically unsaturated compound.

[c9] 9.The composition of claim 1, comprising an aromatic compound and a separate and distinct acetylenically unsaturated compound.

[c10] 10.The composition of claim 1, comprising an aromatic compound, in

combination with a separate and distinct ethylenically unsaturated compound and a separate and distinct acetylenically unsaturated compound.

[c11] 11.The composition of claim 1, comprising an aromatic compound that contains no ethylenic or acetylenic unsaturation.

[c12] 12. The composition of claim 1, comprising an aromatic compound that contains ethylenic but no acetylenic unsaturation.

[c13] 13.The composition of claim 1, comprising an aromatic compound that contains acetylenic but no ethylenic unsaturation.

[c14] 14.The composition of claim 1, comprising an aromatic compound that contains both ethylenic and acetylenic unsaturation.

[c15] 15.The composition of claim 1, comprising an aromatic compound that contains multiple aromatic compounds, at least one of which contains no unsaturation, and at least one of which contains at least one of ethylenic and acetylenic unsaturation.

[c16] 16.The composition of claim 1, comprising a monocylic aromatic compound.

[c17] 17.The composition of claim 1, comprising benzene.

[c18] 18.The composition of claim 1, comprising a substituted monocyclic compound.

[c19] 19.The composition of claim 1, comprising at least one of toluene, xylene, mesitylene, cumene, and cymene.

[c20] 20.The composition of claim 1, comprising a polycyclic aromatic compound.

[c21] 21.The composition of claim 1, comprising at least one of pentalene, indene, naphthalene, azulene, heptalene, biphenylene, and phenalene.

[c22] 22.The composition of claim 1, comprising at least one substituted polycyclic aromatic compound containing one or more substituents independently selected from C_1-C_8 alkyl, fluoro, C_1-C_8 fluoroalkyl, C_1-C_8 alkoxy, and combinations thereof.

[c23] 23.The composition of claim 1, comprising non-aromatic unsaturation, in the form of ethylenically unsaturated and/or acetylenically unsaturated moieties, including at least one of the following:

vinylCH_2=CH-

allyl CH_2=CH-CH_2-

isopropenyl CH_2=C(CH_3)-

ethynyl CH≡C-

2-propynyl CH≡C-CH_2-

1-propenyl CH_3-CH=CH-

2-butenyl CH_2-CH=CH-CH_2-

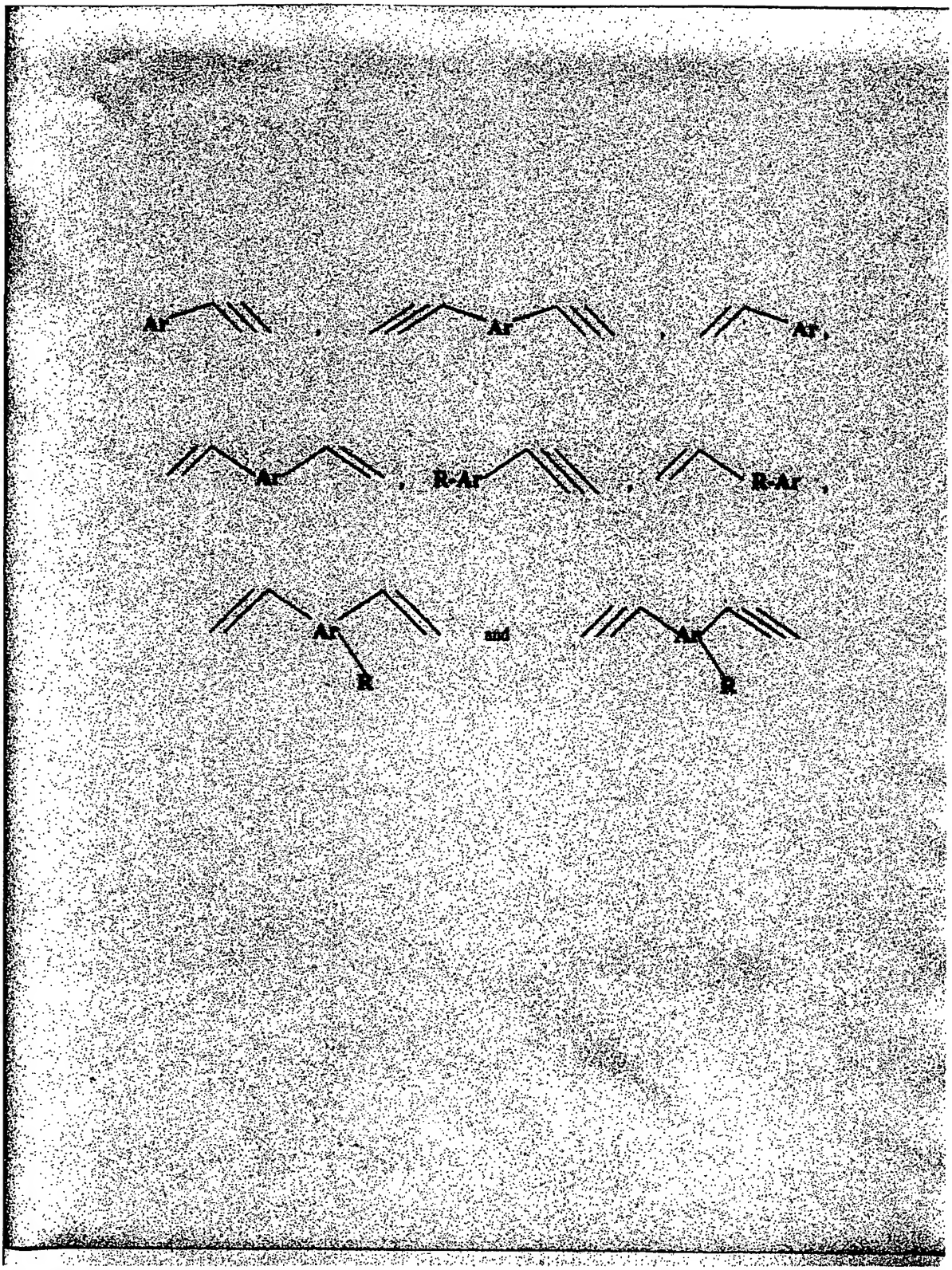
1,3-butadienyl CH_2=CH-CH=CH-

2-pentenylCH_3-CH_2-CH=CH-CH_2-

2-penten-4-ynyl CH≡C-CH=CH-CH_2-

[c24]

Unknown;User;24.The composition of claim 1, comprising at least one ethylenically and/or acetylenically substituted aromatic compound, selected from those of the formulae:



OLE_LINK1wherein Ar is an aromatic moiety and R is selected from vinyl, aryloxy, polyaryloxy, ethynyl, methoxy, iodo, bromo, chloro, fluoro, amino, hydroxyl, nitrile, carbo: C_1-C_8 alkyl, C_1-C_8 fluoroalkyl and C_1-C_8 perfluoroalkyl.

[c25] 25.The composition of claim 24, wherein Ar is a monovalent, divalent or trivalent radical of a monocyclic or polycyclic ring structure.

[c26] 26.The composition of claim 25, wherein said ring structure is selected from benzene, naphthalene, pentalene, indene, azulene, heptalene, biphenyl, triphenyl, biphenylene, phenalene, propacene and butacene.

[c27] 27.The composition of claim 24, wherein Ar is selected from 5- and 6-member carbocylic and heterocyclic aromatic rings.

[c28] 28.The composition of claim 24, wherein Ar is selected from thiophene rings, thiazole rings, furan rings, pyrrole rings, imidazole rings and benzene rings.

[c29] 29.The composition of claim 24, wherein Ar is a polynuclear moiety wherein at least one pair of adjacent aromatic rings is joined by an oxo (-O-) group, or a carbonyl (-C(O)-) group.

[c30] 30.The composition of claim 24, wherein R is aryloxy or polyaryloxy.

[c31] 31. The composition of claim 24, wherein R is selected from O-Ph, -O-BiPh, and -O-Ph-O-Ph, wherein Ph is phenyl and BiPh is biphenyl.

[c32] 32.The composition of claim 1, comprising one of the following:
Ar-C ≡ CH and HC ≡ CH, wherein each of the aromatic and acetylene compounds is independently present in an amount of 1-50% by volume, based on the total volume of such compounds, and wherein the total volume of the compounds equals 100%;
HC ≡ C-Ar-C ≡ CH and HC ≡ CH, wherein each of the aromatic and acetylene compounds is independently present in an amount of 1-50% by volume, based on the total volume of such compounds, and wherein the total volume of the compounds equals 100%; and
HC ≡ C-Ar(R)-C ≡ CH and $H_2C{=}CH_2$, wherein R is as previously described, each of the aromatic and ethylene compounds is independently present in an amount of 1-50% by volume, based on the total volume of such compounds, and wherein the total volume of the compounds equals 100%.

[c33] 33.The composition of claim 1, comprising at least one of phenylacetylene and

phenylethylene.

[c34] 34.A method of forming a low k dielectric film on a substrate by CVD from a precursor subjected to CVD conditions, said method comprising using as said precursor a precursor composition comprising a gaseous mixture of (i) at least one aromatic compound, (ii) an inert carrier medium and (iii) optionally at least one unsaturated constituent that is ethylenically and/or acetylenically unsaturated.

[c35] 35.The method of claim 34, wherein said CVD conditions include plasma enhancement of the CVD.

[c36] 36.A method of forming a low k dielectric film on a substrate by CVD from a precursor subjected to CVD conditions, said method comprising using as said precursor a precursor composition including at least one aromatic compound as well as non-aromatic unsaturation in the form offunctional group(s) or separate compound(s).

[c37] 37.The method of claim 36, wherein said CVD conditions include plasma enhancement of the CVD.

[c38] 38.A method of forming a low k dielectric film on a substrate by CVD from a precursor subjected to CVD conditions, said method comprising using as said precursor a precursor composition including at least one aromatic monomer, and at least one unsaturated compound selected from ethylenically unsaturated compounds and acetylenically unsaturated compounds, wherein said at least one unsaturated compound is a cross-linking agent for the aromatic monomer.

[c39] 39.The method of claim 38, wherein said precursor composition comprises one of the following:

Ar-C ≡ CH and HC ≡ CH, wherein each of the aromatic and acetylene compounds is independently present in an amount of 1-50% by volume, based on the total volume of such compounds, and wherein the total volume of the compounds equals 100%;

HC ≡ C-Ar-C ≡ CH and HC ≡ CH, wherein each of the aromatic and acetylene compounds is independently present in an amount of 1-50% by volume, based

on the total volume of such compounds, and wherein the total volume of the compounds equals 100%; and

$HC \equiv C-Ar(R)-C \equiv CH$ and $H_2C=CH_2$, wherein R is as previously described, each of the aromatic and ethylene compounds is independently present in an amount of 1-50% by volume, based on the total volume of such compounds, and wherein the total volume of the compounds equals 100%.

[c40] 40.A method of forming a low k dielectric film on a substrate by CVD from a precursor subjected to CVD conditions, said method comprising using as said precursor a precursor composition including from about 1 to about 99% by volume of an aromatic compound and from about 1 to about 99% by volume of an inert carrier gas, based on the total volume of the aromatic compound and inert carrier gas, and wherein said CVD conditions comprise plasma-enhanced chemical vapor deposition (PECVD) conditions in a plasma chamber containing a substrate, so that the precursor composition in plasma form is contacted with the substrate in the plasma chamber to deposit a low k dielectric film on the substrate.

[c41] 41.A method of forming a low k dielectric film on a substrate by CVD from a precursor subjected to CVD conditions, said method comprising using as said precursor a precursor composition including from about 1 to about 99% by volume of (1) an aromatic compound and from about 1 to about 99% by volume of (2) acetylene or ethylene gas, based on the total volume of the aromatic compound and ethylene/acetylene gas, together with (3) a carrier gas, having a volume of from about 1 to about 99% by volume, based on the total volume of the aromatic compound and ethylene/acetylene gas, wherein said CVD conditions comprise plasma-enhanced chemical vapor deposition (PECVD) conditions in a plasma chamber containing a substrate, so that the precursor composition in plasma form is contacted with the substrate in the plasma chamber to deposit a low k dielectric film on the substrate.

[c42] 42.A method of forming a low k dielectric film on a substrate by CVD from a precursor subjected to CVD conditions, said method comprising using as said precursor a precursor composition selected from (I) and (II):

(I)a precursor composition including from about 1 to about 99% by volume of an aromatic compound and from about 1 to about 99% by volume of an inert carrier gas, based on the total volume of the aromatic compound and inert carrier gas; and

(II)a precursor composition including from about 1 to about 99% by volume of (1) an aromatic compound and from about 1 to about 99% by volume of (2) acetylene or ethylene gas, based on the total volume of the aromatic compound and ethylene/acetylene gas, together with (3) a carrier gas, having a volume of from about 1 to about 99% by volume, based on the total volume of the aromatic compound and ethylene/acetylene gas,

wherein the CVD conditions include temperature in a range of from about 50 ° C to about 500 ° C so that the precursor composition is thermally dissociated to deposit a low k dielectric film on the substrate.

[c43] 43.The method of claim 42, wherein the inert carrier gas is selected from argon, helium, krypton and xenon.

[c44] 44.The method of claim 42, wherein the precursor composition comprises at least one of phenylacetylene and phenylethylene.